Docket No.: 050395-0315 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	:	Customer Number: 20277
Yasushi ITOH, et al.	:	Confirmation Number: 4103
Application No.: 10/524,270	:	Tech Center Art Unit: 1775
Filed: February 11, 2005	:	Examiner: Daniel H. Miller

For: ALUMINUM NITRIDE SINTERED COMPACT, METALLIZED SUBSTRATE, HEATER, JIG AND METHOD FOR PRODUCING ALUMINUM NITRIDE SINTERED COMPACT

TRANSMITTAL OF APPEAL BRIEF

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith is Appellant's Appeal Brief in support of the Notice of Appeal filed August 28, 2007. Please charge the Appeal Brief fee of $510.00 to Deposit Account 500417.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due under 37 C.F.R. 1.17 and 41.20, and in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPEAL BRIEF

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is submitted in support of the Notice of Appeal filed August 28, 2007, wherein Appellant appeals from the Primary Examiner's rejection of claims 1 and 23-28.

I. REAL PARTY IN INTEREST

This application is assigned to Sumitomo Electric Industries, Ltd. by assignment recorded on February 11, 2005, at Reel 016900, Frame 0088.

II. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any related Appeal or Interference.

III. STATUS OF CLAIMS

Claims 1 and 23-33 are pending in this application. Claims 2-22 were cancelled, and claims 29-33 have been withdrawn from consideration pursuant to the provisions of 37 C.F.R. §1.142(b). Claims 1 and 23-28 have been finally rejected. It is from the final rejection of claims 1 and 23-28 that this Appeal is taken. Claims 1 and 23-28 are copied in the Appendix to this Appeal Brief.

IV. STATUS OF AMENDMENTS

No amendment has been filed subsequent to the final Official Action mailed on May 31, 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The subject matter disclosed in the present application is related to an aluminum nitride sintered body, a metallized substrate, and a heater. The present application addresses, for example, the following problems:

There has been a demand for a substrate made of an aluminum nitride sintered body ("aluminum nitride substrate"), for example, having a size considerably larger than dimensions of 100 mm by 300 mm, as a substrate for an electronic part used in a laser printer, copying machine, etc. Furthermore, there is a demand for an aluminum nitride substrate having improved properties in terms of flatness such as controlled warp or waviness in addition to properties such as controlled deflection. With a conventional method, it has been difficult to produce an aluminum nitride substrate having a large area and a small thickness and yet exhibiting such a controlled warp and waviness, and such substrates have not been available. Page 2, lines 9-20 of the specification.

One aspect disclosed in the present application is to provide, among other things, an aluminum nitride sintered body having a large area and a small thickness, and also having the property of a controlled warp and waviness. Page 2, line 22 to page 3, line 6 of the specification.

Independent claim 1 recites an aluminum sintered body. The aluminum nitride sintered body (1, Fig. 1) (page 18, lines 6-7) has a maximum length of 320 mm or more (ML, Fig. 1) (page 18, lines 13-14), a thickness of more than 0 mm and 2 mm or less (T, Fig. 1) (page 18, lines 17-18), a warpage of 0 μm/mm or more and less than 1 μm/mm (page 19, lines 10-13), and a local waviness height of 0 μm or more and 50 μm or less (H, Fig. 2) (page 18, line 21 to page 19, line 1) after a sintering step is finished (S600, Fig. 4).

Independent claim 26 recites a metallized substrate. The metallized substrate (12, Fig. 11) comprises:

a plate-shaped substrate made of an aluminum nitride sintered body (1, Fig. 11) having a maximum length of 320 mm or more (ML, Fig. 1) (page 18, lines 13-14), a thickness of more than 0 mm and 2 mm or less (T, Fig. 1) (page 18, lines 17-18), a warpage of 0 μm/mm or more and less than 1 μm/mm (page 19, lines 10-13), and a local waviness height of 0 μm or more and 50 μm (H, Fig. 2) (page 18, line 21 to page 19, line 1) after a sintering step is finished (S600, Fig. 4); and

an electrically conductive metallized layer (13, Fig. 11) that is formed on at least a part of the substrate.

Independent claims 28 recites a heater. The heater (14, Figs. 12 and 13) comprises:

a metallized substrate comprising a plate-shaped substrate made of an aluminum nitride sintered body (1, Figs. 12 and 13) having a maximum length of 320 mm or more (ML, Fig. 1) (page 18, lines 13-14), a thickness of more than 0 mm and 2 mm or less (T, Fig. 1) (page 18, lines 17-18), a warpage of 0 μm/mm or more and less than 1 μm/mm (page 19, lines 10-13), and a local waviness height of 0 μm or more and 50 μm or less (H, Fig. 2) (page 18, line 21 to page 19, line 1) after a sintering step is finished (S600, Fig. 4), an electrically conductive metallized layer (page 37, line 22 to page 38, line 1) formed on at least a part of the substrate;

an electrode part (15a, 15b, Fig. 12) arranged on the metallized layer and connected to the metallized layer; and

an insulating layer (17, Fig. 13) arranged on the metallized layer.

VI. GROUNDS OF REJECTION TO BE REVIEWED BY APPEAL

Claims 1 and 23-28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,732,318 ("Natsuhara").

VII. ARGUMENT

Rejection of claims 1 and 23-28 under 35 U.S.C. § 103(a) as being unpatentable over Natsuhara

Legal precedent is well developed on the subject of obviousness in the application of a rejection under 35 U.S.C. §103. It is incumbent upon the examiner to factually support a conclusion of obviousness. *In re Mayne,* 104 F.3d 1339, 41 USPQ2d 1451 (Fed. Cir. 1997*); In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). The examiner must provide a reason why one having ordinary skill in the art would have been led to modify a particular prior art reference in a particular manner to arrive at a particular claimed invention; *Ecolochem Inc. v. Southern California Edison, Co.* 227 F.3d 361, 56 USPQ2d 1065 (Fed. Cir. 2000); *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998). *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 227 USPQ 657 (Fed. Cir. 1985); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967); *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727 (2007).

Claim 1 is an independent claim and reproduced as follows:

> 1. An aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less

> than 1 μm/mm, and a local waviness height of 0 μm or more and 50 μm or less after a sintering step is finished.

The Examiner admitted that Natsuhara "is silent as to the maximum length being greater than 320 mm or the waviness" (paragraph 4 of the Office Action dated May 31, 2007 ("Office Action")). However, the Examiner asserted, "because of the similarity in composition conductance and warpage the waviness would inherently be substantially similar," and "[i]t would have been obvious... to use a length of greater than 320 mm because the substrates are cut to size (example 2) of various lengths and could be sized to fit any heater apparatus of different sides requirements" (paragraphs 5 and 7 of the Office Action).

Appellant submits that the Examiner has not established a *prima facie* basis to deny patentability to the claimed invention under 35 U.S.C. §103 for lack of the requisite factual basis. Natsuhara does not teach an aluminum nitride sintered body having (1) a maximum length of 320 mm or more, (2) a thickness of more than 0 mm and 2 mm or less, (3) a warpage of 0 μm/mm or more and less than 1 μm/mm, and (4) a local waviness height of 0 μm or more and 50 μm or less, after a sintering step is finished, as recited in independent claim 1.

The present invention addresses the following problem:

> However, recently there has been a demand for a substrate made of an aluminum nitride sintered body (hereinafter, referred to as an "aluminum nitride substrate"), for example, having a size considerably larger than the above-mentioned dimensions of 100 mm by 300 mm, as a substrate for an electronic part used in a laser printer, copying machine, etc. Furthermore, there is a demand for an aluminum nitride substrate having improved properties in terms of flatness such as controlled warp or waviness in addition to properties such as controlled deflection as mentioned above. With such a conventional method as mentioned above, it has been difficult to produce an aluminum nitride substrate having a large area and a small thickness and yet exhibiting such a controlled warp and waviness, and such substrates have not been available.

The second full paragraph at page 2 of the specification. Before the present invention, a substrate satisfying requirements (1) to (4) of claim 1 was not available.

A. Requirement (1): maximum length

With respect to requirement (1), the Examiner asserted, "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to use a length of greater than 320 mm because the substrate are cut to size (example 2) of various lengths and could be sized to fit any heater apparatus of different size requirement," (paragraph 11 of the Office Action).

In response, Appellant stresses that the Examiner overlooked the issue identified in the specification, i.e., "[w]ith such a conventional method as mentioned above, it has been difficult to produce an aluminum nitride substrate having a large area and a small thickness and yet exhibiting such a controlled warp and waviness, and such substrates have not been available," (see the second full paragraph at page 2 of the specification) (emphasis added). Natsuhara in Example 2 describes, "This sintered body was cut into dimensions of 300 mm by 10 mm" (column 17, lines 37-38). However, the reference does not teach whether the cut sintered body satisfies at least requirements (3) and (4) of claim 1. Requirement (1) may be met by simply cutting the sintered body into a piece so as to meet the requirement. Even so, Appellant emphasizes that Natsuhara is silent on, at a minimum, whether a sintered body having a maximum length of 320 mm or more and a thickness of more than 0 mm and 2 mm or less satisfies at least requirement (3) and (4).

In paragraph 12 of the Office Action, the Examiner cited *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976), and *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984) to assert that requirement (1) is simply a change in size. However, these cases are distinguishable from the present application because in these cases, the limitations regarding a size are not required to define the claimed invention, while in claim 1, the claimed aluminum nitride sintered body cannot be defined without requirement (1) (see the second full paragraph at page 2 of the specification, reproduced above).

In the *In re Rinehart* case, the claims relate to commercial production of polyesters. The claims includes the limitations "commercial scale production" and "commercial scale quantities," but the court found that addition of the limitations are considered mere scaling up of a prior art process capable of being scaled up. *See* 189 USPQ at 148. In the *Gardner* case, the court held, "The trial court would not have been clearly erroneous in concluding that the dimensional limitations did not specify a device which performed and operated any differently from the prior art." *See* 220 USPQ at 786 (emphasis added). In contrast, requirement (1) is necessary to define the claimed invention. As described in the specification, what is claimed is an aluminum nitride sintered body having a maximum length of 320 mm or more which meets, at least requirement (3) "a warpage of 0 μm/mm or more and less than 1 μm/mm" and requirement (4) "a local waviness height of 0 μm or more and 50 μm or less." In fact, Natsuhara does not disclose or teach an aluminum nitride sintered body having a maximum length of 320 mm or more which meets at least requirements (3) and (4). Accordingly, *In re Rinehart* and *Gardner v. TEC Systems, Inc.* are distinguishable from the present application.

Appellant, therefore, submits that the Examiner's assertion that "[i]t would have been obvious... to use a length of greater than 320 mm because the substrate are cut to size (example 2) of various lengths and could be sized to fit any heater apparatus of different size requirement" is illogical. Claim 1 has to be considered based on the combination of requirements (1) to (4).

B. Requirements (3) and (4): warpage and waviness height

As indicated above, the Examiner asserted, "because of the similarity in composition conductance and warpage the waviness would inherently be substantially similar." Appellant respectfully disagrees with the Examiner's position.

The specification on pages 10 and 11 describes that the warpage and waviness can be controlled by more than 10-hour drying time, and 20 to 60% of the closed space volume ratio (see

Table II to IV). The drying time and closed space volume ratio are not taught by Natsuhara. These can improve the warpage and waviness. Accordingly, the Examiner's assertion is illogical.

With respect to requirement (3) "a warpage of 0 μm/mm or more and less than 1 μm/mm," Natsuhara teaches that the warpage is "preferably not more than 2.0 mm" (column 9, lines 35-36). Appellant submits that "less than 1 μm/mm" and "not more than 2.0 mm" are completely different from each other. In fact, Natsuhara provide only one example that the warpage is 1.8 mm (column 13, lines 11-12). Furthermore, the warpage of Natsuhara is one obtained after grinding (see column 12, lines 58-61; and column 13, lines 11-12), while the claimed warpage is a sintered body itself. Natsuhara further suggests that the warpage is not more than 3.3 μm/mm. This value is obtained based on the following description "both of longitudinal warpage and waviness were not more than 1 mm in each substrate" (column 17, lines 5-6) and "[s]ubstrate having lengths of 300 mm" (column 18, line 27). The value "3.3 μm/mm" is almost the same as comparative sample No. 54 in Table IV of the specification. Comparative sample No. 54 is the worst warpage among those in Table II to IV. The value "3.3 μm/mm" is 3.3 times greater than the claimed upper limit "1 μm/mm."

Regarding requirement (4) "a local waviness height of 0 μm or more and 50 μm or less," Natsuhara teaches that the waviness is "preferably not more than 2.0 mm" (column 9, lines 35-36). Natsuhara's "not more than 2.0 mm" is quite big relative to the claimed "50 μm or less." The value "2.0 mm" is greater than the value of comparative sample No. 54, and 40 times greater than the claimed upper limit "50 μm." To support "not more than 2.0 mm," Natsuhara only discloses one example that the waviness is 2.0 mm." Natsuhara does not specifically teach any definition of "not more than 2.0 mm." In addition, the waviness of Natsuhara is one obtained after grinding (see column 12, lines 58-61; and column 13, lines 11-12), while the claimed waviness is a sintered body itself.

Based on the foregoing, Appellant submits that Natsuhara does not teach an aluminum nitride sintered body including all the limitations recited in independent claim 1.

Claim 23 is dependent from claim 1 and requires the following:

> 23. An aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less than 1 μm/mm, and a local waviness height of 0 μm or more and 50 μm or less, wherein the sintered body is formed by polishing one side of the sintered body according to claim 1 with a polishing allowance of 10 μm or less.

Appellant submits that Natsuhara does not teach these additional requirements, nor have they been addressed in the Office Action. It is submitted, therefore, that the rejection of claim 23 is not viable for both the lack of disclosure in the applied references of all requirements of parent claim 1, and for additionally recited elements.

Claim 24 is dependent from claim 1 and requires the following:

> 24. The aluminum nitride sintered body according to claim 1, wherein the sintered body has a thickness of less than 1 mm.

Appellant submits that Natsuhara does not teach these additional requirements, nor have they been addressed in the Office Action. It is submitted, therefore, that the rejection of claim 24 is not viable for both the lack of disclosure in the applied references of all requirements of parent claim 1, and for additionally recited elements.

Claim 25 is dependent from claim 1 and requires the following:

> 25. The aluminum nitride sintered body according to claim 1, wherein the sintered body has a thermal conductivity of 85 W/m•K or more and 105 W/m•K or less and is used for a heater substrate.

Appellant submits that Natsuhara does not teach these additional requirements, nor have they been addressed in the Office Action. It is submitted, therefore, that the rejection of claim 25 is not viable for both the lack of disclosure in the applied references of all requirements of parent claim 1, and for additionally recited elements.

Claim 26 is an independent claim and reproduced as follows:

26. A metallized substrate comprising:

a plate-shaped substrate made of an aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less than 1 μm/mm, and a local waviness height of 0 μm or more and 50 μm after a sintering step is finished; and

an electrically conductive metallized layer that is formed on at least a part of the substrate.

Claim 26 recites an aluminum nitride sintered body as recited in independent claim 1. Accordingly, Appellant incorporates the arguments made in response to the rejection of independent claim 1. Appellant submits that Natsuhara does not teach a metallized substrate including all the limitations recited in independent claim 26.

Claim 27 is dependent from claim 26 and requires the following:

27. The metallized substrate according to claim 26, comprising:

a substrate including an aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, and a local waviness height of 0 μm or more and 50 μm or less;

an electrically conductive metallized layer formed on at least a part of a surface of the substrate, wherein the metallized substrate has a warpage of 0 μm/mm or more and 5 μm/mm or less.

Appellant submits that Natsuhara does not teach these additional requirements, nor have they been addressed in the Office Action. It is submitted, therefore, that the rejection of claim 27 is not viable for both the lack of disclosure in the applied references of all requirements of parent claim 26, and for additionally recited elements.

Claim 28 is an independent claim and reproduced as follows:

28. A heater comprising:

a metallized substrate comprising a plate-shaped substrate made of an aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less than 1 μm/mm, and a

local waviness height of 0 μm or more and 50 μm or less after a sintering step is finished, an electrically conductive metallized layer formed on at least a part of the substrate;

an electrode part arranged on the metallized layer and connected to the metallized layer; and

an insulating layer arranged on the metallized layer.

Claim 28 recites an aluminum nitride sintered body as recited in independent claim 1.

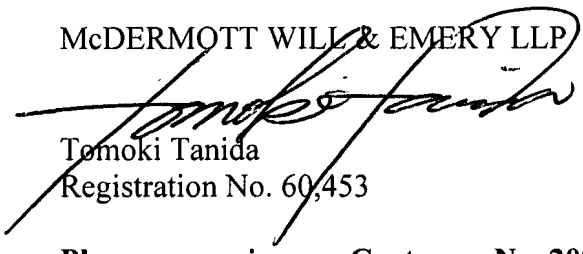
Accordingly, Appellant incorporates the arguments made in response to the rejection of independent claim 1. Appellant submits that Natsuhara does not teach a heater including all the limitations recited in independent claim 28.

VIII. CONCLUSION

For all of the foregoing reason, Appellant respectfully submits that the grounds of rejection of the claims on appeal is in error and should be reversed.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP



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Please recognize our Customer No. 20277 as our correspondence address.

IX. CLAIMS APPENDIX

1. An aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less than 1 μm/mm, and a local waviness height of 0 μm or more and 50 μm or less after a sintering step is finished.

23. An aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less than 1 μm/mm, and a local waviness height of 0 μm or more and 50 μm or less, wherein the sintered body is formed by polishing one side of the sintered body according to claim 1 with a polishing allowance of 10 μm or less.

24. The aluminum nitride sintered body according to claim 1, wherein the sintered body has a thickness of less than 1 mm.

25. The aluminum nitride sintered body according to claim 1, wherein the sintered body has a thermal conductivity of 85 W/m•K or more and 105 W/m•K or less and is used for a heater substrate.

26. A metallized substrate comprising:

a plate-shaped substrate made of an aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less than 1 μm/mm, and a local waviness height of 0 μm or more and 50 μm after a sintering step is finished; and

an electrically conductive metallized layer that is formed on at least a part of the substrate.

27. The metallized substrate according to claim 26, comprising:

a substrate including an aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, and a local waviness height of 0 μm or more and 50 μm or less;

an electrically conductive metallized layer formed on at least a part of a surface of the substrate, wherein the metallized substrate has a warpage of 0 μm/mm or more and 5 μm/mm or less.

28. A heater comprising:

a metallized substrate comprising a plate-shaped substrate made of an aluminum nitride sintered body having a maximum length of 320 mm or more, a thickness of more than 0 mm and 2 mm or less, a warpage of 0 μm/mm or more and less than 1 μm/mm, and a local waviness height of 0 μm or more and 50 μm or less after a sintering step is finished, an electrically conductive metallized layer formed on at least a part of the substrate;

an electrode part arranged on the metallized layer and connected to the metallized layer; and

an insulating layer arranged on the metallized layer.

X. EVIDENCE APPENDIX

No evidence has been submitted of record under 37 CFR 1.130, 1.131 or 1.132.

XI. RELATED PROCEEDINGS APPENDIX

No decision have been rendered in Related Appeals or Interferences.